1. Does the State maintain an electronic data system to track information on wells and operators along with other related information? If so, what is the name of the system and what is the extent of the information that it tracks?

   Yes, MDNR maintains the Underground Injection Control (UIC) application. The application tracks: Company, Contact, Facility, Permit, Well, Inspection, Violation, and Enforcement information.

   DHSS: In-house database collects general information about the site and size of the Onsite Wastewater Treatment Systems.

2. How and who enters new information and/or updated well information into this system?

   MGS: Staff members in the Energy Resources Unit enter new and updated information to the application through a web interface.

   DHSS: Onsite Wastewater Treatment Program staff.

3. Typically how soon is the information added?

   New and updated information is typically added to the application within a week of it being provided.

4. Are there other entities who have access rights for entering information into the system?

   No

5. Is the information contained in electronic data system available to the public and if so, how?

   Inventory information is published online at https://dnr.mo.gov/geology/geosrv/geores/docs/classvwellinventory.xlsx on a semi-annual basis.

   All information is available by making a request pursuant to Missouri's Open Records Law (Chapter 610, RSMo), commonly called the Sunshine Law.

6. What progress or problems is the State having in the data entry area?

Significant progress has been accomplished in entering a backlog of information that had accumulated while the UIC program did not have a functional system or a process for contacting, requesting information, or receiving information from the permitting authorities. Problems with data entry typically revolve around the data system, which was designed to comply with EPA requirements for flowing data, requiring more data than that required for basic inventory or that provided or collected by the permitting authority. In addition, records for older wells are typically incomplete and determining the current status can be a challenge.

H. MDNR 1425 Program Evaluation Questionnaire Responses

Comprehensive Program Evaluation of the Missouri

Safe Drinking Water Act Section 1425

Underground Injection Control (UIC) Program

General Program

A. Statutory Authorities and Regulatory Jurisdictions

1. What year did EPA grant primary authority to your agency for permitting and regulating Class II injection?

   EPA granted primacy to the State of Missouri's Department of Natural Resources effective December 2, 1983.

2. What is the state statutory authority upon which Missouri's 1425 UIC program is based?

   Chapter 259, RSMo Oil and Gas Production.

3. Does your statutory authority include the ability to promulgate new rules or modify existing ones? If so, please describe and cite the enabling authority or authorities.

   Yes, rulemaking authority lies in section 259.070, RSMo.

4. What changes have been made to the regulations since primacy was granted and how have those changes impacted the UIC program?

   There have been several changes to the regulations since primacy was granted December 2, 1983. These changes have clarified regulatory requirements, resulting in improved protection of Missouri's Underground Sources of Drinking Water (USDW).

B. Administration and Program Development

1. Please provide an agency organizational chart and identify UIC positions along with their roles and responsibilities.

   Carol Comer, Director - Department of Natural Resources

   Joe Gillman, Director - Missouri Geological Survey

   Amber Steele, Director – Geological Survey Program

   Larry Pierce, Chief – Geologic Resources Section

   Chris Vierrether, Chief – Energy resources Unit; Supervisorial coordination and management of 1425 Program and 1425 Program reporting to EPA.

   Vacant, Geologist; UIC 1425 Program well data acquisition, data management, well inventory collection and update, permit review, document review, public awareness, data retrieval, and technical assistance and support.

2. What training is required for new UIC staff and how do existing staff stay current on the UIC program?

   Missouri Geological Survey staff members are required to:

   - Familiarize themselves with federal, state, and county regulations and policies affecting the 1425 Program
   - Attend training concerning the geology and hydrology of Missouri
   - Attend UIC inspector training as opportunities are made available
   - Attend UIC EPA/Four State meetings as funding allows
   - Attend Groundwater Protection Council conferences as funding allows
   - Attend other training as it becomes available and as funding allows

3. How many Class II wells by operating status are in the State inventory at this time?

   As of May 23, 2019:

C2 Disposal	10
Active	9
Abandoned	1
C2 Enhanced Oil Recovery (EOR)	424
Active	346
Shut-In	10

Orphaned	1
Abandoned	67

4. Does the state allow for the "land-spreading" of solid waste generated by injection well drilling operations? If so is this information maintained by the State and available to the public?

   The land-spreading of solid waste generated by injection well drilling operations is not regulated by Chapter 259, RSMo.

   However, under Chapter 644, RSMo, the Department of Natural Resources' Water Protection Program regulates land-spreading based on well type, well purpose, waste materials, and land application areas. Some permitting exemptions (allowances) are established in state regulations. As these vary widely, they are reviewed and assistance provided on a case-by-case basis.

5. Does the State have any regulations which govern the retention by injection well owners/operators in the state of records, forms, reports and other items that are required by a permit? If so, what is the retention period that these records must be maintained and kept on file and available upon the State's request?

   Yes. 10 CSR 50-2.080 Record Retention and Reporting. The retention period is five years.

   What happens at the end of the five years? Does the operator make the records available to the state or are they allowed to just discard them?

   The Secretary of State signed off on a new retention schedule. The operator must have permit records on file and available for five years. Certain records asked for or required by MDNR stay in house until the well(s) becomes inactive. Records held by MDNR will be archived once inactive. Any important records should be on file with MDNR as required by regs and or permit conditions. Files deemed proprietary are not transmitted. After five years, regs/permit conditions become vague and only specify that the operator is required to retain files for five years but does not mention what to do with files after.

6. Does the State have any notification requirements regarding injection wells being sold or transferred to another company or individual(s)? If so, are there any time limits or constraints when this must be accomplished?

Yes. The relevant language from the regulation is cited below.

10 CSR 50-2.010(6) Operator License.

No less than thirty (30) calendar days prior to the planned transfer, an operator (transferor) shall submit to the state geologist, on a form provided by the department, a request to transfer any open well(s).

C. Well Operations

Permitting:

1. Describe the steps that an applicant must take when applying to drill a Class II Injection well?

a) Apply and receive approval from the state geologist for a commercial operator's license.
b) Submit and receive approval from the state geologist for a sufficient bond that is secured by an approved financial assurance instrument.
c) Submit for review to the state geologist an application for a permit to drill, deepen, plug-back, or recomplete a well, accompanied by the associated fee.
d) Submit additional information and/or documentation requested by the state geologist within thirty days.
e) Receive approval from the state geologist for a permit to drill, deepen, plug-back, or recomplete a well.
f) Drill the well within one year after the date of approval.
g) If the operator opts not to drill the well, submit a notice to cancel well permit to the state geologist on or before thirty days after the permit void date.
h) Prior to any change or modification of a permit, or any change in the operation of a well subject to 10 CSR 50, the operator must submit a revised permit accompanied by the associated fee for review and approval by the state geologist.
i) Drill and construct the well in compliance with 10 CSR 50-2.040.
j) Retain and/or submit samples in compliance with 10 CSR 50-2.050(2) and the approved permit to drill, deepen, plug-back, or recomplete a well.
k) Submit a completion or recompletion report within 120 calendar days after the spud date or commencement of recompletion of a well.
l) Submit in writing and received by the state geologist before the completion or recompletion report due date a request for a 60 day extension, if necessary.
m) Submit logs and records of the well upon request by the state geologist.

2. Does the State have any public notification requirements regarding the intention to drill? If so, please elaborate.

   No, the state does not require any public notification regarding the intention to drill an injection well. However, an injection permit applicant must provide certain notice of the intent to operate an injection well pursuant to 10 CSR 50-2.055(4).

3. What information is required by the State in an injection well permit application?

   Please see Oil and Gas Permit to Inject or Injection Permit Modification Application Form 780-0212 for all required information.

4. Does the state allow for area (multi well) permits? If so, what are the differences in the type of information that is required in the application?

   Yes, for permits to drill to depths ≤ 1,500 feet. Sufficient bonding must be in place for all proposed wells. The same form is used; the permit type box is used to state whether the permit is for an individual well permit or a blanket well permit. The blanket well permit proposes a template to drill multiple wells. The blanket permit must be accompanied by a plat map showing all the unit boundaries, location of all existing and proposed wells, each well's identifying number, and appropriate symbols to distinguish between existing wells and proposed wells. The map must conform to the well location requirements specified in 10 CSR 50-2.030(3). The operator must submit an Oil and Gas Permit to Drill or Modify Well Application and fee within 24 hours after commencement of drilling each well. A completion or recompletion report must be submitted within 120 calendar days after the spud date of each well. Multi-well permits (aka blanket permits) are not issued to inject or drill to depths greater than 1500 feet.

5. Who makes the determination if a permit application is complete?

   The Energy Resources Unit Chief based on staff recommendation.

6. What procedure is followed when an application is found to be incomplete?

   The state geologist or his or her designee will notify the operator and suspend the application process. When the missing form, information, or fee is submitted by the operator and received by the state geologist, the fifteen (15) business day review period will begin anew. If the state geologist has not received the missing or incomplete application information or fee within thirty (30) days after notification of

the operator, the application will be considered null and void and the operator must reapply by submitting a new application for a permit to inject or to drill, deepen, plug back, or recomplete, along with the associated fee. 10 CSR 50-2.030(6) describes this process for applications for permits to drill, deepen, plug back, or recomplete. 10 CSR 50-2.055(6) describes this process for applications for permits to inject.

7. Once an application has been determined to be complete, what is the process for development of a draft permit?

   Language from the relevant regulations is cited below.

   10 CSR 50-2.030(6): Oil and Gas Permit to Drill or Modify Well Application

   (A) If the state geologist finds that the application is in good form, that all requirements of the application have been met, and that Chapter 259, RSMo, and implementing regulations are being met, the state geologist will issue the permit.

   (B) If the state geologist determines either that the application is not in proper form, that the operator failed to submit the applicable fees, or that Chapter 259, RSMo, and implementing regulations are not being met, the permit will be denied.

   (C) If the state geologist finds that the drilling of a well at the proposed site would be an undue risk to the surface or subsurface environment, the state geologist shall deny the permit.

   (D) If the state geologist determines that the operator is in violation of any provision of

   Chapter 259, RSMo, or implementing regulations, the state geologist may deny the permit.

   10 CSR 50-2.055(6): Oil and Gas Permit to Inject or Injection Permit Modification Application

   (A) If the state geologist finds that the application is in good form, that all requirements of the application have been met, and that Chapter 259, RSMo, and implementing regulations are being met, the state geologist will issue the permit.

   (B) If the state geologist determines either that the application is not in proper form, that the operator failed to submit the applicable fees, or that Chapter 259, RSMo, and implementing regulations are not being met, the permit will be denied.

(C) If the state geologist finds that injection at the proposed site would be an undue risk to the surface or subsurface environment, the permit will be denied.

(D) If the state geologist determines that the operator is in violation of any provision of

Chapter 259, RSMo, or implementing regulations, the state geologist may deny the permit.

8. In general how much time elapses during the permitting process from when the permit application is received until a permit is finalized?

   For applications for permits to inject, the Department has 15 business days to review the permit pursuant to 10 CSR 50-2.055(6), provided the operator has published notice of an intent to operate an injection well and met the 15 calendar day written comment period pursuant to 10 CSR 50-2.055(4).

   For applications for permits to drill, deepen, plug-back, or recomplete, the Department has 15 business days to review the permit pursuant to 10 CSR 50-2.030(6).

9. What are the well siting restrictions for Class II injection wells in the state and are there regulations and/or restrictions governing the distance at which wells may be placed from drinking water wells, public drinking water sources, surface waters, residential/commercial buildings, geologic hazards or any other environmentally sensitive areas? If so, please specify.

   Language from the relevant regulations is cited below.

   10 CSR 50-2.030(6): Oil and Gas Permit to Drill or Modify Well Application

   (C) If the state geologist finds that the drilling of a well at the proposed site would be an undue risk to the surface or subsurface environment, the state geologist shall deny the permit.

   10 CSR 50-2.055(6): Oil and Gas Permit to Inject or Injection Permit Modification Application

   (C) If the state geologist finds that injection at the proposed site would be an undue risk to the surface or subsurface environment, the permit will be denied.

   10 CSR 50-2.090(2): (Disposal of Fluids by Injection)

An injection well for the disposal of fluids must be located a minimum of one hundred sixty-five feet (165') from a unit boundary.

10 CSR 50-3.020 Production Units and Well Spacing for Enhanced Recovery

(1) No well, including, but not limited to, those used for production or injection, drilled within a production unit shall be drilled nearer than one hundred sixty-five feet (165') from the production unit boundary. Stratigraphic test wells are exempt from this requirement.

10. Are there groundwater protection areas and/or sensitive groundwater areas within the state? If so, please identify them and describe how this information is used during the UIC permitting process.

    Missouri's Water Well Construction Code 10 CSR 23-3.090 sets water well construction standards for specific areas within Missouri based upon geologic, hydrologic, and/or environmental factors. These drill areas are outside the current oil and gas producing areas.

11. Is a site visit ever conducted in advance of a permit determination? If so, what is looked at during the visit?

    No.

    Are there any situations where MDNR would conduct a site visit prior to a permit determination?

    A site visit prior to permit determination would take a very special situation to occur such as: unique well construction or sensitive location, or applicant has prior violations, and/or it is a new operator. Site visits typically not conducted due to limited resources.

12. What is the state's process for public participation (i.e., public notification requirements, public hearing process) and how are any comments received during that process addressed?

    Language from the relevant regulations is cited below.

    10 CSR 50-1.020(2) General Procedures

(B) The council also will provide notice to any person whose property interests may be affected by the outcome of the hearing.

10 CSR 50-1.040 Enforcement Action and Appeals Procedures

(3) Any person adversely affected by an order or denial of a permit, license, or transfer issued by the state geologist may appeal the order or denial of a permit, license, or transfer to the council within thirty (30) calendar days of the date the state geologist issued the order or denial. The appeal must be sent by registered or certified mail to the chairperson of the council. The council shall treat the appeal as a contested case consistent with Chapter 259 and Chapter 536, RSMo. The council may conduct any hearing it requires to decide the appeal, or may appoint a hearing officer to make a recommended decision. If the council elects to appoint a hearing officer, the hearing officer must be a licensed attorney and a member in good standing of the Missouri Bar. The council may sustain, reverse, or modify the state geologist's order or denial of a permit, license, or transfer or may make such other orders as it deems appropriate under the circumstances, subject to rights of judicial review as provided in section 259.170, RSMo. If any order or denial of a permit, license, or transfer issued by the state geologist is not appealed within the time provided in this section, the order or denial of a permit, license, or transfer becomes final and may be enforced as provided in sections 259.200 and/or 259.210, RSMo.

10 CSR 50-2.055(4) Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

(A) Notify each of the following parties whose acreage lies partially or fully within a one-half- (½-) mile radius of the project boundaries, by mailing or delivering a copy of the application and notice of intent on or before the date of publication described in subsection (4)(B) to:

1. Each operator or lessee of record;

2. Each owner of record of the mineral rights of unleased acreage; and

3. Each landowner within the project boundaries;

(B) Publish at least one (1) notice of intent to operate an injection well in a newspaper of general circulation in the county in which the proposed injection well(s) is located and include the following:

1. Name and address of applicant;

2. Location of well(s);

3. Geologic name of proposed injection strata and approximate depth of injection zone;

4. Proposed maximum injection rate and pressure;

5. Description of the need for the injection well(s);

6. Approximate maximum number of injection wells that ultimately will be utilized in the project; and

7. Address of the office of the state geologist, where comments may be sent or additional information may be obtained;

(C) Provide an affidavit of notice to include a copy of the newspaper publication and a list of parties notified according to subsection (4)(A); and

Does MDNR conduct follow up to verify the applicant has provided this to nearby property owners? What would MDNR's approach be if a permit application was received by MDNR and nearby property owners with incomplete or incorrect information?

No, follow up verification is not typically done. MDNR does verify proof of publication and that newspaper notices are accurate. Well installations are typically on historic leases and so nearby property owners are aware of their existence.

Application can be provided at the same time as the publication notice. MDNR does not fill out the application information for the applicant. If anything within the public notice is incorrect or has changed from the approved public notice, the public notice must be resubmitted. All reg (7) requirements for the public notice are verified by the MDNR. If an incomplete application comes in, phone call or email to operator is done, then if no reply within 30 days the application is void. Well and injection are separate fees.

(D) A fifteen (15) calendar day written comment period begins on the date of publication. A record will be kept by the state geologist of all written comments received and the responses to these comments. If within this comment period the state geologist determines that a significant degree of public interest is expressed, or other factors indicate the need for a public hearing, the state geologist may order a hearing. Public notice of the hearing will be provided in a newspaper of general circulation in the county where the proposed injection well is located with a hearing date set for no sooner than thirty (30) calendar days after the date of notice. If no public hearing is ordered, the state geologist will process the application after the

end of the fifteen (15) calendar day comment period and upon receipt of an affidavit of newspaper publication.

How does MDNR determine that there is enough public interest to hold a public hearing?

This would relate to operations related to drinking water protections, would be on the oil & gas council or water resource protection.

13. In general, how much time is spent responding to comments from the public received during the public participation portion of the permitting process?

    Typically no public comments are received.

14. How is the owner/operator notified if an application has been approved or denied, and if denied is there an appeal process?

    The state geologist sends an email along with the approved permit to the operator advising the operator that his or her permit has been approved. If the permit is denied the owner/operator is notified via email along with the reasons for denial. The owner/operator may appeal any adverse decisions to the State Oil and Gas Council pursuant to 10 CSR 50-1.040(3).

15. How does the State determine whether a permit should be modified, revoked and reissued, or terminated?

    After all necessary forms, fees, supporting documents, and any other requested information has been received, the state geologist reviews the permit application. If, through the review process, the state geologist determines the drilling of a well or the injection of fluids at the proposed site would be an undue risk to the surface or subsurface environment, the state geologist shall:

    1. Discuss the undue risks with the operator and request the operator offer amendments to the permit application for consideration; and
    2. Deny approval of the permit application if no amendments are offered or the undue risk still exists.

16. If an owner/operator wants to amend an existing injection permit, is the process treated the same or differently from that of a new permit application?

The process is generally treated the same as that of a new permit application.

17. Does the State differentiate between major and minor permit modifications? If so, what is considered a major permit modification and is the process to modify the permit different?

    Yes. Minor modifications to an injection permit do not require submission of a permit application. Language from the relevant regulation relating to major modifications to an injection permit is cited below.

    10 CSR 50-2.055(5) Modifications.

    (A) Modifications to the type or construction of the injection well including, but not limited to, an increase in injection rate or pressure or an additional perforation or injection zone, neither of which is expressly authorized by the existing permit, require an application for a permit to inject to be filed along with the applicable fee pursuant to 10 CSR 50-1.050, except as specified in subsection (5)(B) below.
    (B) No fee will be assessed for an injection permit modification when the operator seeks to add or delete additional sources of the fluid disposed into the well but will not exceed the maximum authorized injection rate and pressure.

18. Are the permit application or operating requirements for Class II commercial salt water disposal wells in Missouri different from those for Class II non-commercial salt water disposal wells? If so how do they differ?

    No.

    Are there any C2 Commercial wells that have been permitted in the state?

    MDNR is not aware of any Class II commercial type wells. Disposal wells are only used for fluids produced by operator of both wells.

19. Does the State require the permit applicant for a Class II injection well to provide an analysis of the produced waters that will be injected at the proposed well? If so what is required in the analysis?

    Yes, an analysis of the produced waters that will be injected at the proposed well is required. 10 CSR 50-2.055(3)(D) requires a description of the fluid to be injected, the source of injected fluid, and compatibility of injected fluid with that of the receiving stratum, including total dissolved solid comparisons.

20. Are there restrictions on the types of fluids that can be used in Class II enhanced recovery operations? If so, what are those restrictions?

    Yes. In accordance with 10 CSR 50-2.055(3)(D) and 10 CSR 50-2.055(6)(C), the injected fluids must be compatible with the receiving formation and must not be an undue risk to the subsurface environment.

Area of Review:

1. What method(s) does the State employ to determine an Area or Review (AoR) a fixed radius and/or a zone of endangering influence?

    The area of review is determined for a single well using a fixed radius of one-half mile. See 10 CSR 50-2.055(3)(A).

21. If the permit request is for an area permit, how is the AoR determined?

    The area of review is determined using a one-half mile radius from the unit boundaries containing the area permit.

22. Where in the current State UIC regulations are there provisions that address "corrective action" for other wells found in an AOR?

    10 CSR 50-2.030(6): Oil and Gas Permit to Drill or Modify Well Application

    (C) If the state geologist finds that the drilling of a well at the proposed site would be an undue risk to the surface or subsurface environment, the state geologist shall deny the permit.

    10 CSR 50-2.055(6): Oil and Gas Permit to Inject or Injection Permit Modification Application

    (C) If the state geologist finds that injection at the proposed site would be an undue risk to the surface or subsurface environment, the permit will be denied.

23. How are wells in need of corrective action but outside of the permit applicant's control dealt with or does that stop the permit from being issued?

Wells in need of corrective action but outside of the permit applicant's control are dealt with on a case-by-case basis. Corrective action or plugging of those wells may be a condition for the permit review process to progress. If specific requirements issued by the state geologist are not met, the permit application is denied. Language from the relevant regulations is cited below.

10 CSR 50-2.030(6): Oil and Gas Permit to Drill or Modify Well Application

(C) If the state geologist finds that the drilling of a well at the proposed site would be an undue risk to the surface or subsurface environment, the state geologist shall deny the permit.

10 CSR 50-2.055(6): Oil and Gas Permit to Inject or Injection Permit Modification Application

(C) If the state geologist finds that injection at the proposed site would be an undue risk to the surface or subsurface environment, the permit will be denied.

10 CSR 50-2.060(3)(A): Plugging Requirements; Abandoned Wells

1. An abandoned well shall be plugged or addressed as directed by the state geologist as provided in these rules.

Well Construction and USDW Protection:

1. <u>What are the requirements for how new Class II wells are to be constructed?</u>

   The requirements are in 10 CSR 50-2.040. Relevant language from this regulation is cited below.

   10 CSR 50-2.040 Drilling and Completion

   (1) During the drilling of any well, surface casing shall be set as follows, except as otherwise required or approved by the state geologist as indicated on the approved permit to drill, deepen, plug-back, or recomplete:

   (A) Through all unconsolidated material plus twenty feet (20') into the underlying competent bedrock; or

(B) In areas where underground sources of drinking water are present above the production or injection zone(s), at a point at least fifty feet (50') below the base of the deepest known underground source of drinking water penetrated.

(2) All casing materials shall be steel or other material of equal or greater strength approved by the state geologist and able to withstand collapse and burst pressures that the well might encounter.

(3) All wells drilled shall be completed with tubing, packer, and a string(s) of casing which are properly cemented at sufficient depths to protect all water, oil, or gas bearing strata and prevents their contents from passing into other strata. For wells drilled to producing strata at a depth of no greater than one thousand five hundred feet (1500'), an operator may set a single casing string with no tubing or packer, if the well is cemented from the bottom of the casing to the surface to seal off and protect any underground source of drinking water. The state geologist may approve other methods of cementing casing in a well.

(4) Cement shall, except as otherwise modified or approved by the state geologist—

(A) Be used in setting all casing or sealing off producing strata, underground porosity gas storage strata, or underground sources of drinking water;

(B) Be installed from the bottom to the top of the casing in one (1) continuous operation using pressure grouting techniques;

(C) Be placed in a minimum one inch (1") annulus between strings of casing or the casing and borehole;

(D) Be maintained at surface level; and

(E) Be in place for at least eight (8) hours and reach a compressive strength of three hundred (300) pounds per square inch before the bottom plug is drilled or before tests are initiated, and before further operations begin.

(5) Multiple-completed wells. Operators may produce from more than one (1) pool through the same wellbore if separation of each pool is maintained and after application to, and approval by, the state geologist. Multiple-completed injection and production wells may be permitted if, in addition to the requirements above, all of the following conditions are met:

(A) Any offsetting production will not be adversely affected;

(B) Underground sources of drinking water will not be endangered;

(C) The well is continuously cemented across the injection and producing intervals; and

(D) The well demonstrates mechanical integrity.

(6) The state geologist may require specific casing and cementing requirements for injection wells based on the following:

(A) The depth of the underground source(s) of drinking water;

(B) The nature of the injected fluids; or

(C) The hydraulic relationship between the injection zone and the underground source(s) of drinking water.

(7) Each operator of a permitted injection well shall comply with the following requirements:

(A) Equip the wellhead with a pressure observation valve and maintain equipment necessary to obtain injection pressure measurements upon inspection by an authorized representative(s) of the state geologist. For injection wells completed prior to March 30, 2016, add the pressure observation valve prior to testing for mechanical integrity, or upon request of the state geologist;

(B) Tubing and packer requirements.

1. Each well permitted shall meet one (1) of the following requirements:

A. Equip the well to inject through tubing below a packer;

B. Set a packer run on the tubing in casing opposite a cemented interval at a point immediately above the uppermost perforation or open-hole interval. Fill the annulus between the tubing and the casing with a corrosion-inhibiting fluid or hydrocarbon liquid. All wells using wellhead pressure to inject fluids must follow the tubing and packer requirements set in this subparagraph; or

C. Construct a packerless or tubingless completion for injection wells drilled to no greater than one thousand five hundred feet (1500') pursuant to paragraph (7)(B)2. or 3. of this regulation.

2. Injection through tubing without a packer is authorized if all of the following

requirements are met:

A. Run the tubing to a depth not shallower than forty feet (40') above the uppermost perforation or open hole of the injection interval;

B. Equip each wellhead with a pressure observation valve on the tubing and the tubing-casing annulus; and

C. Maintain the well so that the mechanical integrity tests can be performed as specified in 10 CSR 50-2.055(12).

3. Injection without tubing is authorized if all of the following requirements are continuously met during the life of the well:

A. The casing is cemented continuously from setting depth to surface;

B. Surface wellhead injection pressure is recorded monthly and kept by the operator for five (5) years;

C. All pressure readings recorded are taken during actual injection operations; and

D. The operator of the tubingless completion maintains the well so that the mechanical integrity tests can be performed as specified in 10 CSR 50-2.055(12).

(8) In existing wells to be converted to other use, including but not limited to injection, all additional casing or recompletion shall be constructed as specified in sections (1) through (7).

(9) All points at which a well is in physical contact with a pool shall meet all minimum distance requirements as specified in 10 CSR 50. For horizontal wells, submit a directional survey with the well completion or recompletion report to verify points at which the well is in contact with the pool.

(10) Any well not constructed in compliance with requirements of this regulation shall be shut in, according to 10 CSR 50-2.060 until compliance is achieved.

(11) All stratigraphic test wells that are not converted to another type of well must be permanently plugged according to 10 CSR 50-2.060(3) within ninety (90) calendar days of the spud date. A single thirty (30) calendar day extension period may be granted upon written request to the state geologist. If conversion is to take place, submit a permit modification to the state geologist as detailed in 10 CSR 50-2.030(9) or 10 CSR 50-2.060(4) prior to conversion. The well will then be subject to all completion and location requirements for the type of well to which it is being converted.

24. <u>How does the State determine the depth of the lowermost USDW and how is that information used when setting the surface casing?</u>

    A series of MDNR-MGS open-file maps displaying the total dissolved solids (TDS) concentrations of groundwater in select stratigraphic aquifer packages are used to determine the presence or absence of a USDW at a specified location. The TDS is displayed by equal TDS concentration contours created from water quality tests derived from numerous data resources. The well location and stratigraphic log accompanying the permit to inject application, and perhaps other information as necessary, are used to determine the surface casing depth in compliance with 10 CSR 50-2.040 (Drilling and Completion), which states:

(1) During the drilling of any well, surface casing shall be set as follows, except as otherwise required or approved by the state geologist as indicated on the approved permit to drill, deepen, plug-back, or recomplete:

(A) Through all unconsolidated material plus twenty feet (20') into the underlying competent bedrock; or

(B) In areas where underground sources of drinking water are present above the production or injection zone(s), at a point at least fifty feet (50') below the base of the deepest known underground source of drinking water penetrated.

25. How does the State ensure that a new well is designed so that USDWs are effectively isolated and protected?

    As part of the Oil and Gas Permit to Inject or Injection Permit Modification Application, specific information concerning the well construction, a well/wellhead schematic, and a lithologic log are required. See https://dnr.mo.gov/forms/780-0212-f.pdf for more information. The application review compares this information to MDNR open-file TDS maps and other geologic and hydrologic resources as necessary.

26. Does the State maintain maps or other records showing the extent vertically and horizontally of USDWs in the state? If so, is this information updated as additional information becomes available and is this information readily available to permit applicants?

    Yes, Missouri maintains TDS maps and other records that show or could be used to determine the vertical and horizontal extent of USDWs within Missouri. This information is updated as funding and resources allow and is available online.

27. Does the State require wells converting from production wells to injection wells to have the casing strings which go through any USDWs cemented in place or other workover requirements prior to allowing for conversion?

    10 CSR 50-2.040(8) specifies that existing wells to be converted to other use must meet certain construction requirements. Relevant language from this regulation is cited below.

    10 CSR 50-2.040 Drilling and Completion

(3) All wells drilled shall be completed with tubing, packer, and a string(s) of casing which are properly cemented at sufficient depths to protect all water, oil, or gas bearing

strata and prevents their contents from passing into other strata. For wells drilled to producing strata at a depth of no greater than one thousand five hundred feet (1500'), an operator may set a single casing string with no tubing or packer, if the well is cemented from the bottom of the casing to the surface to seal off and protect any underground source of drinking water. The state geologist may approve other methods of cementing casing in a well.

(4) Cement shall, except as otherwise modified or approved by the state geologist—

(A) Be used in setting all casing or sealing off producing strata, underground porosity gas storage strata, or underground sources of drinking water;

(B) Be installed from the bottom to the top of the casing in one (1) continuous operation using pressure grouting techniques;

(C) Be placed in a minimum one inch (1") annulus between strings of casing or the casing and borehole;

(D) Be maintained at surface level; and

(E) Be in place for at least eight (8) hours and reach a compressive strength of three hundred (300) pounds per square inch before the bottom plug is drilled or before tests are initiated, and before further operations begin.

(5) Multiple-completed wells. Operators may produce from more than one (1) pool through the same wellbore if separation of each pool is maintained and after application to, and approval by, the state geologist. Multiple-completed injection and production wells may be permitted if, in addition to the requirements above, all of the following conditions are met:

(A) Any offsetting production will not be adversely affected;

(B) Underground sources of drinking water will not be endangered;

(C) The well is continuously cemented across the injection and producing intervals; and

(D) The well demonstrates mechanical integrity.

(6) The state geologist may require specific casing and cementing requirements for injection wells based on the following:

(A) The depth of the underground source(s) of drinking water;

(B) The nature of the injected fluids; or

(C) The hydraulic relationship between the injection zone and the underground source(s) of drinking water.

(8) In existing wells to be converted to other use, including but not limited to injection, all additional casing or recompletion shall be constructed as specified in sections (1) through (7).

Well Completion:

1. How does the State handle modifications or changes in the construction from those provided in the application?

   Language from the relevant regulation is cited below.

   10 CSR 50-2.030 Application for Permit to Drill, Deepen, Plug-Back, or Recomplete

   (9) Prior to any change or modification of a permit, or any change in the operation of a well subject to these regulations, the operator shall notify the state geologist, identifying the well name, location, the proposed change, and a full explanation of the nature of the change. An appropriately revised permit application or application for permit for well recompletion along with the applicable fee pursuant to 10 CSR 50-1.050 shall be submitted to the state geologist for approval, except as provided in subsection (3)(C). No modification or change in operation may begin until the state geologist has reviewed and approved the revised application. The state geologist will review and respond to the notification within fifteen (15) business days. The review period will be suspended if additional information is necessary to effectively review the application. When the missing form or information is submitted by the operator and received by the state geologist, the fifteen (15) business day review period will begin anew.

28. What level of detail or information is required from the owner/operator after completion of an injection well?

    Please see Oil and Gas Well Completion or Recompletion Report and Well Log, Form-MO 780-0215 for all required information.

29. How long does a well owner/operator have to provide a well completion or re-completion report of a Class II injection well or disposal well back to the state? Is this time frame specified by regulation?

Pursuant to 10 CSR 50-2.050, the operator has 120 calendar days after the spud date or commencement of recompletion of a well to submit the well completion or recompletion report. A 60-day extension may be granted upon request.

30. Does the state ever witness well completion activities?

    The state rarely witnesses well completion activities.

    What situations would prompt MDNR to witness a well completion?

    Under special situations, water protection areas, other wells, etc.

Injection Pressures:

1. Are there provisions in the State's UIC regulations which:
   Address maximum injection volumes and/or pressures necessary to assure that fractures are not initiated in the confining zone; and,

   Yes

   Stipulate that injected fluids and formation fluids are not allowed to migrate or be displaced into any underground source of drinking water (USDW)?

   Yes

   Please provide EPA a copy of these state provisions.

   Language from the relevant regulations is cited below.

   10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

   (3)(F) Information showing that injection into the proposed injection zone will be contained within the injection zone and will not initiate fractures through the overlying or underlying strata that could enable the fluid or formation fluid to enter underground sources of drinking water. This information includes the name, description, depth of overlying and underlying confining strata for the injection zone, and computed fracture gradients.

(9) Injection pressures. A maximum injection pressure for injection wells will be established by the state geologist so that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the confining strata. The injection pressure also should not cause the injected fluid to migrate into an underground source of drinking water.

(A) The injection pressure determinations shall be approved by the state geologist based on one (1) of the following methods:

1. For injection of liquids, injection pressures at 0.75 psig/foot based upon the depth to the midpoint of the perforations or open hole interval in the injection zone; or

2. For injection of steam or other gases, injection pressures at 3.0 psig/foot based upon the depth to the midpoint of the perforations or open hole interval in the injection zone; or

3. Pump pressure data provided by the operator that details the ability of the injection zone to tolerate the requested pressure; or

4. Step-rate test data provided by the operator that details the ability of the injection zone to tolerate the requested pressure; or

5. Historical injection pressures provided by the operator and/or other data deemed appropriate by the state geologist to demonstrate an appropriate injection pressure.

(B) At least one (1) test must be performed within one thousand three hundred twenty feet (1320') of the proposed injection well, or as otherwise deemed appropriate by the state geologist. The data and interpretive report should be submitted in the format requested by the state geologist.

(C) Following approval by the state geologist of an initial maximum injection pressure, the well used to obtain the data in paragraph (9)(A)3. or 4. above may be used as a reference well. Additional injection wells within one thousand three hundred twenty feet (1320') of the reference well may be approved at the same maximum injection pressure.

(D) The established maximum injection pressure shall not be exceeded. Exceedance of the maximum injection pressure may result in additional compliance monitoring. Modifications to increase a maximum injection pressure for injection wells will be made according to section (5) above.

(10) Following receipt of an approved permit to inject, the operator shall notify the state geologist regarding injection operations as follows:

(A) Immediately upon the commencement of injection operations, notify the state geologist of the date of commencement; and

(B) After permanent discontinuance of injection operations, notify the state geologist, within ninety (90) calendar days, of the date of the discontinuance and the reasons for discontinuance.

(11) Monitoring. Following an initial mechanical integrity test in accordance with subsection (12)(A) below, once a month, the operator shall monitor and record, during actual injection, the pressure or fluid level in the annulus and any other information deemed necessary by the state geologist. An annual report of information logged will be submitted to the state geologist in accordance with 10 CSR 50-2.080.

10 CSR 50-2.090 Disposal of Fluids by Injection

(1) Other than within the original production strata, disposal of produced fluid from an oil or gas operation is prohibited into an oil or gas reservoir, a potential oil or gas reservoir, or an underground source of drinking water unless that drinking water source has been exempted, or unless otherwise approved by the state geologist.

31. Have there been any problems related to over-pressuring of wells or formations due to injection activities?

UIC staff members are not aware of any problems related to over-pressuring of wells or formations due to injection activities.

If so, how has MDNR responded?

N/A

3. Are owners/operators required to notify the State of problems associated with over-pressuring or lack of adequate confinement for Class II wells?

Notification of certain conditions is required. Language from the relevant regulations is cited below.

10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

(5) Modifications.

(C) Each application for any modifications to the injection permit, including increasing pressure or rate and changing or adding injection strata, requires the notice specified in section (4) of this regulation.

(9) Injection pressures. A maximum injection pressure for injection wells will be established by the state geologist so that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the confining strata. The injection pressure also should not cause the injected fluid to migrate into an underground source of drinking water.

(13) If a well cannot demonstrate mechanical integrity, or if other conditions develop that threaten or could threaten the quality of surface or groundwater, the operator shall cease operation of the well, notify the state geologist within twenty-four (24) hours with details as to the nature of the problem, and propose a corrective action plan in writing within five (5) business days. The operator shall have no more than sixty (60) calendar days from the date of initial failure in which to perform one (1) of the following:

(A) Repair and retest the well to demonstrate mechanical integrity; or

(B) Plug the well.

10 CSR 50-2.060 Shut-in Wells, Plugging, and Conversion to Water Well

(2) Shut-off test. Whenever it appears to the state geologist that any water from any well is migrating or infiltrating into oil-bearing or gas-bearing strata or that any detrimental substances are infiltrating any underground sources of drinking water, the state geologist may require a shut-off test, to be conducted at the expense of the operator of that well. The time and procedure for the taking of the test will be fixed by the state geologist. Reasonable notice of the test will be given to the owner or operator. The owner or operator of any abandoned oil or gas well from which water is migrating or infiltrating into any oil-bearing or gas-bearing strata, or from which any detrimental substances are infiltrating any underground sources of drinking water, shall immediately plug or repair the well in accordance with section (3) below and shall prevent the infiltration of oil, gas, produced water, or other detrimental substances into underground sources of drinking water strata.

10 CSR 50-2.065 Operations

(2) Spill Notification. Each operator, immediately upon discovery or knowledge of any spill or release, will take immediate action in accordance with the Spill Bill, section

260.500 to 260.550, RSMo, and the implementing regulations in 10 CSR 24. This does not alter responsible parties' obligations under any other applicable law.

4. <u>For salt water disposal wells and enhanced recovery wells, what is the State requirement regarding the frequency of monitoring and recording of actual injection pressure and annulus pressure?</u>

   Language from the relevant regulations is cited below.

   10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well

   Stimulation Treatment

   (11) Monitoring. Following an initial mechanical integrity test in accordance with subsection (12)(A) below, once a month, the operator shall monitor and record, during actual injection, the pressure or fluid level in the annulus and any other information deemed necessary by the state geologist. An annual report of information logged will be submitted to the state geologist in accordance with 10 CSR 50-2.080.

   10 CSR 50-2.080 Record Retention and Reporting

   (1) Record Retention.

   (B) Each operator of an injection well shall keep current, accurate, and legible records of the amount and kind of fluid injected into the injection well and preserve these records for five (5) years.

   (2) Monthly Reporting. Each operator shall prepare in full the following monthly reports on a form provided by the department and submit to the state geologist no later than forty-five (45) calendar days after the end of each calendar month:

   (C) Disposal of produced water, including the amount, type, and method of disposal of all fluids produced from oil wells, gas wells, or underground gas storage reservoirs;

   (3) Annual reporting. Each operator shall submit an annual report completed in full on a form provided by the department for the following:

   (A) An annual injection well monitoring report for the previous calendar year, submitted to the state geologist on or before March 1 of the following year;

5. How frequently are these pressures reported to the State and how long is the monitoring report maintained by the owner/operator and the State?

   The injection pressures are reported to Missouri annually in accordance with 10 CSR 50-2.055(11) and 10 CSR 50-2.080(3)(A). The monitoring report is maintained by the owner/operator and Missouri for five years in accordance with 10 CSR 50-2.080(1)(B).

   If deemed necessary by the state geologist, could the reporting frequency be adjusted to be more than annually?

   Will discuss internally. This could be done through a permit modification. The state geologist has leeway but unsure if this could be done by order by the state geologist (will check).

Confinement of Injected Fluids:

1. Do state regulations specifically prohibit fracturing of confining units as a consequence of stimulation or exceeding the permitted maximum injection volumes and/or pressures in the injection zone (i.e., the formation(s) where injection is taking place)?

   Yes. Language from the relevant regulations is cited below.

   10 CSR 50-2.030: Oil and Gas Permit to Drill or Modify Well Application

   (4) Seismic shot holes. Seismic operations shall not initiate new fractures or propagate existing fractures in the confining strata of underground sources of drinking water.

   10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well

   Stimulation Treatment

   (3) Each application for permit to inject shall be submitted on a form provided by the department, along with the applicable fee pursuant to 10 CSR 50-1.050, completed in full, and accompanied by—

   (F) Information showing that injection into the proposed injection zone will be contained within the injection zone and will not initiate fractures through the overlying or underlying strata that could enable the fluid or formation fluid to enter underground sources of drinking water. This information includes the name,

description, depth of overlying and underlying confining strata for the injection zone, and computed fracture gradients.

(9) Injection pressures. A maximum injection pressure for injection wells will be established by the state geologist so that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the confining strata. The injection pressure also should not cause the injected fluid to migrate into an underground source of drinking water.

2. Does MDNR determine fracture pressure for Class II injection wells in order to ensure that the confining zone above and below the injection formation will remain intact?

   No, but the Department sets the limits on injection pressure, rate, and volume.

   So how are the limits determined?

   10 CSR 50-2.055 (9) Section 9. Maximum injection pressures; without any information, appicant can inject 0.75 psi/ft into the middle point of the perforated interval in the injection zone. Regulations have rates for different types of injectate (steam, gas, etc). If applicant requests a higher rate, then step-rate test is used. Can use historical pressures. Few step-rate tests conducted due to the costs.

   If so, please describe the process and include any formulas that may be used to make that determination.

   10 CSR 50-2.055(9), formula process.

D. Financial Assurance

1. Please explain in detail the various mechanisms that are allowed to be used by the owner/operator in order to establish financial assurance. For each financial assurance mechanism, please indicate the following:

   The Department may accept a certificate of deposit, surety bond, or letter of credit as a financial assurance instrument. Language from the relevant regulation is cited below.

(3) Financial assurance instruments. The state geologist may accept as financial assurance instruments surety bonds, certificates of deposit, and irrevocable letters of credit.

(A) Surety bonds shall be subject to the following conditions:

1. Only irrevocable surety bonds shall be accepted. No bond of a surety company shall be cancelled for any reason whatsoever, including, but not limited to, nonpayment of premium, bankruptcy, or insolvency of the operator or issuance of notices of violations or cessation orders and assessment of penalties with respect to the operations covered by the bond, except that surety bond coverage for wells not drilled may be cancelled if the surety provides written notification and the state geologist is in agreement. The state geologist shall advise the surety, within thirty (30) days after receipt of a notice to cancel bond, whether the bond may be cancelled;

2. The surety shall be licensed to conduct a surety business in Missouri; and

3. Both the surety and the operator shall be primarily liable for completion of any remedial actions, including, but not limited to, well plugging, with the surety's liability being limited to the amount of the bond.

(B) Certificates of deposit shall be subject to the following conditions:

1. The certificate(s) shall be in the amount of the bond or in an amount greater than the bond and shall be made payable to or assigned to the state of Missouri, both in writing and upon the records of the institution issuing the certificates, and shall be automatically renewable at the end of the term of the certificate. If assigned, institutions issuing the certificate(s) waive all rights of set off or liens against the certificate(s);

2. No single certificate of deposit shall exceed the sum of two hundred fifty thousand dollars ($250,000) nor shall any permittee submit certificates of deposit aggregating more than two hundred fifty thousand dollars ($250,000) or the maximum insurable amount as determined by the Federal Deposit Insurance Corporation from a single institution. The institution issuing the certificate of deposit must be insured by the Federal Deposit Insurance Corporation (FDIC);

3. Any interest on the certificates of deposit shall be made payable to the operator; and

4. The certificate of deposit shall be kept until the bond is released by the state geologist.

(C) Letters of credit shall be subject to the following conditions:

1. The letter of credit shall be no less than the face amount of the bond and shall be irrevocable. A letter of credit used as security shall be forfeited and collected by the state geologist if not replaced by other suitable bond or letter of credit at least thirty (30) days before its expiration date;

2. The beneficiary of the letter of credit shall be the state of Missouri;

3. The letter of credit shall be issued by a bank authorized to do business in the United States. If the issuing bank is located in another state, a bank located in Missouri must confirm the letter of credit. Confirmations shall be irrevocable and on a form provided by the department;

4. The letter of credit shall be governed by Missouri law. The Uniform Customs and Practice for Documentary Credits, fixed by the International Chamber of Commerce, shall not apply;

5. The letter of credit shall provide that the state geologist may draw upon the credit by making a demand for payment, accompanied by his/her statement that the operator's bond has been declared forfeited; and

6. The issuer of a letter of credit or confirmation shall warrant that the issuance will not constitute a violation of any statute or regulation which limits the amount of loans or other credits which can be extended to any single borrower or customer or which limits the aggregate amount of liabilities which the issuer may incur at any one (1) time from issuance of letters of credit and acceptances.

(D) Notification Requirements.

1. In the event the surety company becomes unable to fulfill its obligation under the bond for any reason, notice shall be given immediately to the operator and the state geologist.

2. The surety company or financial institution issuing the financial assurance instrument for bonding purposes shall give prompt notice to the state geologist and the operator of any change in name or address of the institution, or any insolvency or bankruptcy of the institution or any notice received or action filed alleging the insolvency or bankruptcy of the institution or alleging any violations of regulatory requirements which could result in suspension or revocation of the institution's license to do business.

3. The financial assurance instrument shall provide a mechanism for a surety company or financial institution to give notice per paragraph 2. above.

4. Upon the incapacity of any surety company or financial institution by reason of insolvency or bankruptcy, or suspension or revocation of its charter or license, the operator shall be deemed to be without bond coverage in violation of section (1). The state geologist, upon notification of the institution's bankruptcy or insolvency,

or suspension or revocation of its charter or license, shall issue a notice of violation against any operator who is without bond coverage. The notice shall specify a thirty-(30-) day period to replace bond coverage. If the financial assurance instrument is not replaced in thirty (30) days, an order shall be issued by the state geologist requiring immediate cessation of operations. Operations shall not resume until the state geologist has determined that an acceptable bond secured by an approved financial assurance instrument has been posted.

How are the dollar amounts established and if there are limits on what those amounts?

Bonding schedule amounts are determined by the State Oil and Gas Council. The current bonding schedules for single and blanket bonds are listed below. The dollar amount of the bond is established based on the depth of the well(s).

10 CSR 50-2.020 Bonds

(2) Bond Amounts. Bond amounts, as determined by the council, shall be no less than the following amounts:

MINIMUM SINGLE WELL BOND

Depth of Well		
From	To	Amount
0'	500'	$1,100
501'	1000'	$2,200
1001'	2000'	$3,300
2001'	5000'	$4,400
5001'	_____	$5,500 plus $2/foot beyond 5001 feet

Bonds for horizontal wells shall be based on the total measured length of the wellbore from the surface to the depth of the deepest producing horizon.

MINIMUM BLANKET WELL BOND

Depth of Well			Number of Open
From	To	Amount	Wells/bond
0'	800'	$22,000	40 wells

801' 1500' $25,000 10 wells

Wells greater than one thousand five hundred feet (1500') in depth must be bonded individually by a single well bond.

What kind of periodic review occurs to ensure that the level of financial assurance is still adequate?

An annual financial assurance audit is performed to confirm the financial assurance instruments are active.

10 CSR 50-2.080 Record Retention and Reporting

(3) Annual reporting. Each operator shall submit an annual report completed in full on a form provided by the department for the following:

(C) An annual financial assurance report providing documentation of sufficient financial assurance for all open wells, pursuant to Chapter 259, RSMo, and implementing regulations, submitted to the state geologist on or before January 31 of each year and including a signed and notarized statement from any applicable surety or issuer of a letter of credit or certificate of deposit documenting that the referenced instruments are valid and in full force.

32. What is the timing for when a well owner/operator must have a financial assurance mechanism in place?

Bonds and associated financial assurance instruments must be in place before:

1. Wells are transferred to an operator.
2. The start of MGS's review of an Oil and Gas Permit to Drill or Modify Well Application or Oil and Gas Permit to Inject or Injection Permit Modification Application.
3. Replacement of a bond.

Language from the relevant regulations is cited below.

10 CSR 50-2.010 Operator License

(6)(A)3. The transferee has bonding pursuant to 10 CSR 50-2.020 in place;

10 CSR 50-2.020 Bonds

(1) Prior to commencement of drilling or other operations, the operator commencing such drilling or operations shall make, or cause to be made, for each well a good and sufficient bond that—

(C) Remains in full force and effect until a letter of release is issued by the state geologist or the bond is forfeited as provided in section (6) below.

(4) Replacement of bonds. Operators may replace existing surety or personal bonds with other surety or personal bonds. Existing bonds will not be released until the operator has submitted and the state geologist has approved acceptable replacement bonds.

(5) Bond Release. Application for release of a bond, and any instruments securing the bond, shall be made by written notice to the state geologist who will issue the letter of release after plugging of the well, or after a new bond, and any instruments securing the bond, is filed by a successor and an appropriate well transfer form is submitted pursuant to 10 CSR 50-2.010(6), and if the requirements of Chapter 259, RSMo, and implementing regulations have been met.

3. Is the well owner/operator required to adjust the plugging and abandonment cost estimate annually to adjust for inflation? If not annually, then at what frequency are they required to adjust these cost figures?

   No, operators are not required to adjust the bonding cost figures.

   With instances of requiring state funds to plug and abandon wells with insufficient financial guarantees has there been any internal discussion on using this approach?

   Yes, historical discussion has occurred over this topic, but it probably won't change due to operators claiming undue harm with increased costs of additional guarantees.

   Oil/gas remediation fund will be used to plug any wells that can't be plugged by owner. "Fund is in good shape". MDNR used forfeiture money from bonds that were abandoned to plug abandoned wells. Money from the fund was originally granted by the state for emergency purposes. This was a one-time funding event and only gets replenished through bond forfeitures. ~$8,000 - $9,000 currently in the fund.

4. Who is named as "the payee" on all financial assurance mechanisms in the event of default or cancellation by the owner/operator? Which mechanisms list the State as the payee and which mechanisms do not? Please provide EPA examples of these mechanisms.

The State of Missouri pursuant to 10 CSR 50-2.020 Bonds.

5. Have there been instances in the State since 2000 where the financial guarantees posted by the owner/operator were insufficient and state funds were required to be expended in order to accomplish well plugging?

   Yes.

   What happened in those instances?

   Pulled from oil & gas remediation fund to cover PA costs that weren't covered by the bonds.

E. Well Conversions (e.g. from injection to production & production to injection):

1. What steps are required by the State for an owner/operator to perform a well conversion?

   The licensed operator must be compliant with 10 CSR 50 and:

   1. For a conversion to a non-injection well, must submit an Oil and Gas Permit to Drill, Deepen, Plug-Back, or Recomplete application; or
   2. For a non-injection well conversion to an injection well, must comply with 10 CSR 50-2.055, i.e., the entire application process for a permit to inject.

   Language from the relevant regulations is cited below.

   10 CSR 50-2.030 Application for Permit to Drill, Deepen, Plug-Back, or Recomplete

   (9) Prior to any change or modification of a permit, or any change in the operation of a well subject to these regulations, the operator shall notify the state geologist, identifying the well name, location, the proposed change, and a full explanation of the nature of the change. An appropriately revised permit application or application for permit for well recompletion along with the applicable fee pursuant to 10 CSR 50-1.050 shall be submitted to the state geologist for approval, except as provided in subsection (3)(C). No modification or change in operation may begin until the state geologist has reviewed and approved the revised application. The state geologist will review and respond to the notification within fifteen (15) business days. The review period will be suspended if additional information is necessary to effectively review the application. When the missing form or information is submitted by the operator

and received by the state geologist, the fifteen (15) business day review period will begin anew.

10 CSR 50-2.040 Drilling and Completion

(8) In existing wells to be converted to other use, including but not limited to injection, all additional casing or recompletion shall be constructed as specified in sections (1) through (7).

10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

2. Does the State have financial responsibility requirements for the owner/operator when a well is to be converted? If so, please explain what the State requires.

Yes. The well must be continually bonded and secured by sufficient financial assurance per the current bonding schedule. If insufficient bonding exists, the review process for the well conversion will not begin until a sufficient bonding amount secured by sufficient financial assurance is submitted by the operator and approved by the state geologist. Language from the relevant regulations is cited below.

10 CSR 50-2.020 Bonds

(1) Prior to commencement of drilling or other operations, the operator commencing such drilling or operations shall make, or cause to be made, for each well a good and sufficient bond that—

(A) Is secured by an approved financial assurance instrument payable to the state of Missouri, conditioned upon the performance of the duty to comply with all of the laws of the state and the rules and orders of the council;

(C) Remains in full force and effect until a letter of release is issued by the state geologist or the bond is forfeited as provided in section (6) below.

(2)(B) Operators of all wells permitted prior to March 30, 2016, shall maintain existing bonding amounts for such wells until they are transferred pursuant to 10 CSR 50-2.010(6), deepened, plugged-back, or recompleted pursuant to 10 CSR 50-2.030, or plugged pursuant to 10 CSR 50-2.060(3).

(2) (C) Operators of all wells permitted or transferred on or after March 30, 2016, shall comply with bonding amounts stipulated in the Minimum Single Well Bond table or the Minimum Blanket Well Bond table prior to permit issuance or transfer approval.

10 CSR 50-2.030 Application for Permit to Drill, Deepen, Plug-Back, or Recomplete

(9) Prior to any change or modification of a permit, or any change in the operation of a well subject to these regulations, the operator shall notify the state geologist, identifying the well name, location, the proposed change, and a full explanation of the nature of the change. An appropriately revised permit application or application for permit for well recompletion along with the applicable fee pursuant to 10 CSR 50-1.050 shall be submitted to the state geologist for approval, except as provided in subsection (3)(C). No modification or change in operation may begin until the state geologist has reviewed and approved the revised application. The state geologist will review and respond to the notification within fifteen (15) business days. The review period will be suspended if additional information is necessary to effectively review the application. When the missing form or information is submitted by the operator and received by the state geologist, the fifteen (15) business day review period will begin anew.

3. How many well conversions has the State identified in 2016 and how are they tracked?

   Per the Missouri Oil and Gas (O&G) database application, there were zero well conversions in 2016. The Excel spreadsheet is available upon request.

   The well types, well type dates, well statuses, and well status dates are documented in the O&G database, as is a "View History Table" which lists the well's history relative to changes in the well type and well status.

F. Drilling Fluids/Muds:

1. For Class II wells, what are the major drilling fluid/mud types used in the State?

   Currently, the major drilling mud fluid used in Missouri is a bentonite plus gel mixed with fresh water. Shallow wells may only require air rotary methods without a mud fluid.

33. What are the specific additives that are used in drilling muds and fluids in the state?

    Aquagel, caustic soda, soda ash, PacR, Carbonox, Quebracho, EZ Mud, Ball Buster, ConDet, Soap Stix, X-Trend II, BiCarb, lignite, Tannithin, Drispac, Nut Plug, drilling

paper, Multi Seal, Poly Plus, cotton seed hulls, flake, cedar fibers, mica, nut shells, and lime.

G. Waste Disposal:

1. What is the estimated volume of total brine production in Missouri in 2018 and what is the average water to oil ratio?

   The estimated volume of total brine production in Missouri in 2018 is 1,406,883 bbls.

   The average water to oil ratio in Missouri in 2018 is 15:1 bbls.

2. Is the State aware if any operators are reusing and/or recycling their drilling wastes? If so, what percentages of operators in the State's Class II universe are reusing/recycling?

   Missouri is not aware if any operators reuse and/or recycle their drilling wastes.

   Does the State encourage operators to reuse and recycle? If so, how?

   The Missouri UIC/O&G Program does not actively encourage operators to reuse and recycle their drilling wastes.

   Does the State require a copy of shipping manifest anytime waste products are being disposed or conveyed offsite?

   If the materials are hazardous waste, certain requirements relating to manifests are set forth in 10 CSR 25-6.263.

   What is the percentage of Class II wells in State that are being flared and are not being captured?

   Neither Chapter 259, RSMo, nor the State Oil and Gas Regulations address flared gas. This information is not requested from the operators. The percentage of Class II wells flared in Missouri is unknown.

3. Do any local ordinances apply to exploration and production (E&P) wastes in the State? If so, please provide examples.

   The Missouri UIC/O&G Program is not aware of local ordinances in Missouri applying to E&P wastes.

4. Are there any statutory or regulatory provisions in the State requiring the segregation of E&P and hazardous wastes?

   The Missouri UIC/O&G Program is not aware of any statutory or regulatory provisions in the State requiring the segregation of E&P and hazardous wastes.

5. Does the State encourage source reduction, recycling, etc.? If so, how is this conveyed to all owner/operators of oil & gas activities in the state?

   The Missouri UIC/O&G Program is not aware of any encouragement by the state of source reduction, recycling, etc. as it applies to owners/operators of oil & gas activities in Missouri.

6. Does the E&P waste program allow for the disposal of drilling fluids and muds in nonindustrial landfills and if so, how is this tracked and monitored within the State? Is there a paper trail i.e. manifests, invoices, hardcopy sampling data, etc. and where are these documents maintained if at all?

   The Missouri UIC/O&G Program is not aware of any Missouri E&P waste program.

7. Are naturally occurring radioactive materials (NORM) tracked from each oil & gas field and if so, how is it tracked?

   The Missouri UIC/O&G Program is not aware of the occurrence of NORM generated from Missouri oil and gas fields.

H. Well Work-Overs:

1. What information is required from an owner/operator in advance of a planned well workover and what information are they required to provide following completion?

A well workover is treated the same as a new well pursuant to 10 CSR 50-2.030. The operator license, bond, and financial assurance must be approved or existing before the permit review process begins. A permit application for the recompletion must be submitted, reviewed, and approved. A well recompletion report must be submitted following the recompletion pursuant to 10 CSR 50-2.050.

2. How far in advance of a planned workover is the well owner/operator required to notify the state?

   The permit application must be reviewed and approved. By rule, this will be completed within 15 business days once all the necessary information is submitted pursuant to 10 CSR 50-2.030.

3. What are the estimated volumes (barrels), and the types of materials that typically comprise work-over, treatment and completion fluids?

   The Missouri UIC/O&G Program is not aware of this information since no workovers have been reported within the past seven years.

4. How are these well work-over fluids disposed of? If not injected into a Class II well, how is the disposal tracked and verified to ensure that these wastes meet RCRA waste disposal requirements?

   Unknown

5. How is deck drainage from the production site handled/disposed of?

   Unknown

6. What is the typical volume in barrels of deck drainage that is generated from a Class II well?

   Unknown

7. Does the state ever witness well work-over activities?

   There has not been a well workover within the past seven years, so none have been witnessed recently.

I. Well Stimulation/Hydraulic Fracturing Activities:

1. What information is required from an owner/operator in advance of a planned well stimulation/hydraulic fracturing operation and what information are they required to provide following completion.

   Language from the relevant regulation is cited below.

   10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

   (16) Well stimulation treatment projects. At least five (5) business days prior to commencement of a well stimulation treatment project, the operator is required to notify the state geologist in writing the nature of the project. Within thirty (30) calendar days after completion of a well stimulation treatment project, the operator shall submit copies of the well stimulation treatment tickets from the company performing such treatment, including documentation of the materials injected.

2. How far in advance of a planned well stimulation/hydraulic fracturing operation is the well owner/operator required to notify the state?

   Five business days pursuant to 10 CSR 50-2.055.

3. How many active Class II wells in the State inventory have undergone well stimulation/hydraulic fracturing operations?

   Missouri's pre-2016 O&G rules did not require the submission of information regarding stimulation/hydraulic fracturing operations. Missouri has not received any such information for injection wells since the promulgation of the rules in 2016 that addressed this issue.

   In 2016, Missouri promulgated rule 10 CSR 50-2.055(16) to address stimulation treatment projects. The Oil and Gas Well Completion or Recompletion Report and Well Log Form requests information pertaining to well stimulation/hydraulic fracturing. However, no reports have been filed since the rules promulgated in 2016 became effective.

4. Has the State reviewed the EPA Diesel guidance? Has this guidance changed and/or had an effect on the way you are implementing the program?

   Yes, MGS staff has reviewed Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels: Underground Injection Control Program Guidance #84.

   Guidance #84 has had an impact on Missouri's UIC Program; the Department promulgated rules in 2016 that require notification of constituents used during the hydraulic fracturing/stimulation process.

5. For hydraulic fracturing operations, how long does the casing/tubing pressure have to be held to be considered successful and what is the maximum pressure loss that is allowed?

   Missouri rules do not address this issue. For hydraulic fracturing operations, Missouri rules only require the submission of copies of the well stimulation treatment tickets.

6. Does the State require that owner/operators post on FracFocus all chemical constituents used in the fracturing process? If so, how long after the hydraulic fracturing operation has been completed does it typically take for this information to be posted and is there a time limit required under regulation or statue?

   No

7. If not, does the State request that owner/operators voluntarily post the chemical products used in their fracturing process online on FracFocus? If so, has this been successful and how long after the hydraulic fracturing operation has been completed does it typically take for this information to be posted?

   No

8. What has been the level of interest displayed by the public regarding hydraulic fracturing within the State? Has national media attention within the last 24 months or so had any bearing within the State?

   Minimal interest concerning hydraulic fracturing has been received by the MGS. There has been no national media attention that MGS is aware of.

J. Temporarily Abandoned and Permanently Abandoned Wells:

1. How much time must pass before the State can or will designate a Class II injection well as temporarily abandoned?

   MGS recognizes a temporarily abandoned well as any well inactive from its first day of inactivity up to day 90 of continuous inactivity pursuant to 10 CSR 50-2.060 Shut-in Wells, Plugging, and Conversion to Water Well.

2. What are the requirements for a well in temporarily abandoned status?

   Language from the relevant regulation is cited below.

   10 CSR 50-2.060 Shut-in Wells, Plugging, and Conversion to Water Well

   (1) Shut-in wells.

   (A) Shut-in status. A well is considered shut in whenever it has not been operated for ninety (90) calendar days or more. The shut-in status shall not exceed ninety (90) calendar days. Prior to the expiration of the ninety (90) calendar days shut-in status, the operator of that well shall perform one (1) of the following:

   1. Return the well to operation and notify the state geologist on the monthly well status report per 10 CSR 50-2.080(2); or

   2. Plug the well; or

   3. Petition the state geologist for an extension and propose an end date for the shut-in status.

3. Is there a time limit for how long a well can remain in temporarily abandoned status? If so, what actions are required by the state to be taken by the owner/operator once that time limit is reached?

   Language from the relevant regulation is cited below.

   10 CSR 50-2.060 Shut-in Wells, Plugging, and Conversion to Water Well

   (1) Shut-in wells.

   (A) Shut-in status. A well is considered shut in whenever it has not been operated for ninety (90) calendar days or more. The shut-in status shall not exceed ninety (90)

calendar days. Prior to the expiration of the ninety (90) calendar days shut-in status, the operator of that well shall perform one (1) of the following:

1. Return the well to operation and notify the state geologist on the monthly well status report per 10 CSR 50-2.080(2); or

2. Plug the well; or

3. Petition the state geologist for an extension and propose an end date for the shut-in status.

(B) Approval of shut-in status extension.

1. The state geologist may approve an extension of a well's shut-in status not to exceed one (1) year. If the operation of any shut-in well is not resumed within one (1) year after the extension has been approved, the well will be deemed abandoned, and the operator shall plug the well per these rules. Upon application to the state geologist before the expiration of the one- (1-) year period, and for good cause shown, the period may be extended by the state geologist for one (1) year upon compliance with the provisions of paragraph (1)(B)2. of this section. Additional one- (1-) year extensions may be granted by the state geologist. The total time of such consecutive extensions shall not exceed ten (10) years.

4. Does the state differentiate between temporarily abandoned and permanently abandoned wells? If so how, is that distinction made?

   Temporarily abandoned wells or idle wells describe wells initially continuously inactive from one to 90 days. A temporarily abandoned well either becomes shut-in, is approved for extended shut-in status, or becomes abandoned. Below is the state's definition of an abandoned well.

   10 CSR 50-1.030 Definitions

   (1)(A) 2. Abandoned well, a well that is no longer operated for its intended use and has not been shut in, converted to another type of well, or plugged.

5. What are the circumstance under which the State can or will designate a Class II injection well as permanently abandoned?

   Below is the state's definition of an abandoned well.

   10 CSR 50-1.030 Definitions

   (1)(A) 2. Abandoned well, a well that is no longer operated for its intended use and has not been shut in, converted to another type of well, or plugged.

6. In addition to receiving a plugging record from the operator, are there any other means used to confirm that a permanently abandoned well was plugged?

   After receiving a verbal or written statement indicating that a well has been plugged, Department staff members may confirm that the well was plugged by a field visit in which they observe the absence of well casing protruding from the ground.

7. Currently, are there any cases of wells still needing to be plugged after they have been determined to be permanently abandoned? If so, how many?

   Yes. Counting all well types, there are less than 4,816. Some are plugged but must be verified, some have not been drilled, some will be verified as existing and abandoned, some will be orphaned (no responsible party exists), and some will be lost wells (cannot verify existence of well).

K. Plugging and Abandonment:

1. Does the state require submission of a plugging plan for a Class II well from the operator? If so, when is that plan required to be submitted to the state?

   The state generally requires submission of a plan, but there are exceptions to this general rule. Language from the relevant regulation is cited below.

   10 CSR 50-2.060 Shut-in Wells, Plugging, and Conversion to Water Well

   (3) Plugging Requirements.

   (B) Notice.

   1. Before plugging any well the operator shall file with the state geologist a notice of intent to plug on a form provided by the department. The notice will include the details of the proposed plugging procedure and description of any logging tool containing a radioactive source being abandoned (see subsection (E) of this section for radioactive source abandonment procedure). The proposed plugging procedure shall be approved by the state geologist prior to commencement of plugging activities.

   2. The operator shall notify the state geologist no later than five (5) business days before the plugging.

3. Exceptions.

A. If necessary to avoid rig downtime, oral permission to plug dry holes may be obtained by informing the state geologist of proposed plugging procedures, in which case a notice of intent to plug form must be submitted within three (3) business days of plugging.

B. In lieu of prior notice and approval by the state geologist as detailed in paragraph (3)(B)1. of this rule, the operator may elect to plug a well from total depth to the surface with cement slurry, being no less than fifteen

(15) pounds per gallon density, emplaced via a tremie pipe.

C. If an emergency situation exists, the operator shall orally notify and present the plugging proposal to the state geologist for approval.

2. <u>After a Class II well has been plugged, is a plugging record required to be submitted from the operator and is there any other means used by the State to confirm that an abandoned well was plugged?</u>

10 CSR 50-2.060 requires submission of a plugging record. Relevant language from this regulation is cited below.

10 CSR 50-2.060 Shut-in Wells, Plugging, and Conversion to Water Well

(3) Plugging Requirements.

(D) Reporting. The operator shall submit a plugging record completed in full on a form provided by the department along with the applicable fee pursuant to 10 CSR 50-1.050 to the state geologist within thirty (30) calendar days after completion of plugging activities.

On a case-by-case basis, other means may be used by the MGS to confirm a well has been plugged. A representative of MGS may observe the well, but a plugging record must be submitted. In the case of abandoned wells, testimonials may be used to document that a well has been plugged after an exhaustive effort has been conducted that concludes no responsible party for the well can be contacted.

3. <u>Do inspectors ever conduct a well visit to confirm if a well has been plugged or witness well plugging? If so what percentage of wells plugged are ever visited or have the plugging witnessed?</u>

Yes, MGS representatives have conducted site visits to witness a well plugging or to confirm a well has been plugged and the casing cut off below the ground surface. A site visit may be conducted before the bond is released.

4. Is the State able to exercise authority over old wells which were in existence before State oil & gas laws and regulations were passed?

Missouri rarely exercises authority over old wells that were in existence before State oil & gas laws and regulations were passed. Language from the relevant regulation is cited below.

10 CSR 50-2.060 Shut-in Wells, Plugging, and Conversion to Water Well

(3) Plugging Requirements.
(A) Abandoned Wells.

2. When the state geologist investigates and determines that a well has been abandoned, as provided in these rules, the state geologist may issue an order directing the operator, owner, or any person who without authorization tampers with or removes surface equipment or downhole equipment from the abandoned well to plug the well as directed by the state geologist. If the person to whom the order is issued fails to comply with any such order that has become final under 10 CSR 50-1.040, the person to whom the order is issued shall be deemed to have abandoned any and all property interests in the well and any rig, derrick, or other operating structure, and all abutments and appurtenances.

3. In addition to any other remedy provided in Chapter 259, RSMo, or implementing regulations, if the state geologist determines that a well has been abandoned, the department or the council may request that the attorney general institute a civil proceeding to request appropriate injunctive relief, civil penalties, or other appropriate remedy, as provided in sections 259.200 and 259.210, RSMo.

4. If the state geologist determines that a well has been abandoned, the department in accordance with section 259.070.5(7), RSMo, may plug such well, or cause it to be plugged as to prevent contamination or danger of contamination of any waters of the state or loss of underground sources of drinking water, and may remediate contamination from the well. Plugging or remediation may include the collection, removal, salvage, and disposition of abandoned operating structures or other equipment. The cost of the plugging or remediation will be paid by the Oil and Gas Remedial Fund, as provided in section 259.190, RSMo.

5. How many abandoned wells has the State identified in 2018 and have been added to the inventory?

   Counting only injection well types, Missouri has 68 injection wells whose well status is listed as abandoned in the MGS database as of December 31, 2018. Only two of those 68 wells were confirmed as abandoned in the year 2018. MGS cannot be certain that the other 66 wells are abandoned. In MGS's O&G database, based upon past practices, a well categorized as abandoned includes wells that:

   1. Were plugged but must be verified,
   2. Were never drilled,
   3. Will be verified as existing and abandoned,
   4. Will be orphaned (no responsible party exists) or will be lost wells (cannot verify existence that there ever was a well drilled).

   What will be done about the other wells that are on this list? Where is this inventory data pulled from?

   As resources permit the 66 wells will be reviewed to determine if they are a danger to USDW/public health. MGS is doing an audit for past permits and their bonds to see if any are active. Inventory data pulled off database. Going through all abandoned wells to determine if they are abandoned or orphaned and if someone is still responsible for the wells.

   Orphaned category is currently in state inventory – no tie to anyone. Abandoned category can still be tied to someone.

   If a previous owner unsure of if well is still there, a field check will be conducted when an inspector is near the location. Field checks will be a complete site investigation. If the previous owner was found, they would be pushed to plug well with enforcement action going through MDNR. If owners have any violations, the will need to fix violations or sign a compliance form to renew their operator license.

   Of the wells identified in 2018 as being abandoned, how many of these wells were historically permitted wells from the State?

   The two wells identified as abandoned in the year 2018 were permitted by Missouri.

   How many of the identified abandoned Class II wells has the State plugged and abandoned to date in 2019?

   Zero. No funds were allocated for the Oil and Gas Remedial Fund in 2017 or 2018.

Without funds allocated to this fund if an abandoned well with no responsible party were found to cause an undue risk to the subsurface or surface environment does MDNR have other funds available to plug the well?

No other funds exist besides the oil/gas remedial fund. Attorney General may be able to allocate other funds in an emergency.

6. Of these historically permitted Class II wells, does the State attempt to identify and/or locate the owner/operator for compensation? If so, how is this done?

   Yes, Missouri conducts an exhaustive investigation to identify and/or locate the owner/operator for compensation.

   The investigation includes, as available, the following:

   1. Company file document reviews to identify contacts associated with the operator,
   2. Peoplefinders.com to search for current contact information of responsible parties and all individuals who may be a resource to contacting responsible parties,
   3. Sends letter via USPS,
   4. Sends email,
   5. Telephones individuals,
   6. Conducts face-to-face interviews with individuals,
   7. Conducts internet searches on companies and individuals,
   8. Uses social media as a resource to obtain current contact information,
   9. Conducts site visits and documents observations with detailed descriptions and photos,
   10. Other investigative means that become available.

7. Where a responsible party cannot be located, does the State have a Remedial Fund in place to plug wells?

   Yes

   If so, how much did the State allocate for this fund in 2017 and 2018?

   The State did not allocate funds in 2017 or 2018.

   How is the fund supported?

The fund is supported by all proceeds derived from the sale of illegal oil and gas and bond forfeitures pursuant to 259.190, RSMo, 10 CSR 50-1.030(1)(O), 10 CSR 50-2.060(1)(D), and 10 CSR 50-2.060(3)(A). Language from these authorities is cited below.

259.190, RSMo. Contraband, seizure and sale — proceeds and bond forfeitures paid into oil and gas remedial fund, purpose. —

5. All proceeds derived from the sale of illegal oil, illegal gas, or illegal product, as above provided, after payment of costs of suit and expenses incident to the sale, and all amounts obtained by the council from the forfeiture of bonds required under paragraph (d) of subdivision (1) of subsection 5 of section 259.070, shall be paid to the state treasurer and credited to the "Oil and Gas Remedial Fund", which is hereby created. The money in the oil and gas remedial fund may be used by the department to pay for the plugging of, or other remedial measures on, wells. The state treasurer shall be custodian of the fund and may approve disbursements from the fund in accordance with sections 30.170 and 30.180. Notwithstanding the provisions of section 33.080, to the contrary, any moneys remaining in the fund at the end of the biennium shall not revert to the credit of the general revenue fund. The state treasurer shall invest moneys in the fund in the same manner as other funds are invested. Any interest and moneys earned on such investments shall be credited to the fund.

10 CSR 50-1.030 Definitions

(1) The terms used in 10 CSR 50 have the meanings set forth in section 259.050, RSMo, or this rule, unless the context of the term clearly indicates otherwise.

(O) Terms beginning with the letter O.

2. Oil and Gas Remedial Fund, the fund established by section 259.190.5, RSMo into which forfeited bond monies and proceeds from the sale of illegal oil, illegal gas, and illegal product are deposited, which is to be used for plugging abandoned wells as provided for in 10 CSR 50-2.060(3)(F).

10 CSR 50-2.060 Shut-in Wells, Plugging, and Conversion to Water Well

(1) Shut-in wells.

(D) Plugging of shut-in wells. If the well is not returned to service or properly plugged pursuant to these rules before the end of the shut-in status, the well will be considered abandoned and shall be plugged within thirty (30) calendar days. After

the thirty- (30-) day period, if the well has not been plugged pursuant to these rules, the bond in place for the well shall be forfeited and deposited into the Oil and Gas Remedial Fund according to 10 CSR 50-2.020(6) and utilized according to 10 CSR 50-2.060(3)(F).

(3) Plugging Requirements.

(A) Abandoned Wells.

4. If the state geologist determines that a well has been abandoned, the department in accordance with section 259.070.5(7), RSMo, may plug such well, or cause it to be plugged as to prevent contamination or danger of contamination of any waters of the state or loss of underground sources of drinking water, and may remediate contamination from the well. Plugging or remediation may include the collection, removal, salvage, and disposition of abandoned operating structures or other equipment. The cost of the plugging or remediation will be paid by the Oil and Gas Remedial Fund, as provided in section 259.190, RSMo.

Is there a means in place for prioritizing wells for plugging?

No

L. Seismicity:

1. In light of recent media attention focused on induced seismicity, are there state statutes or other rules or policies which address potential induced seismicity in the State? If not, has there been discussion if there is a need for with other entities?

   Language from the relevant regulations is cited below.

   10 CSR 50-2.030 Application for Permit to Drill, Deepen, Plug-Back, or Recomplete

   (6)(C) If the state geologist finds that the drilling of a well at the proposed site would be an undue risk to the surface or subsurface environment, the state geologist shall deny the permit.

   10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

   (6)(C) If the state geologist finds that injection at the proposed site would be an undue risk to the surface or subsurface environment, the permit will be denied.

2. What protective actions is the State taking to minimize the likelihood of any induced seismic events as the result of Class II well activities?

   The current permitted injection, pressures, rates, and volumes of injection wells are well below those that are reported to be associated with induced seismicity. In addition, according to the Department's database of wells, Missouri's injection wells are shallow (2,407 feet maximum depth) compared to injection well depths reported to be associated with induced seismicity. During the permit review process for wells and injection of fluids, the geologic setting is taken into account.

3. Does the State require owner/operators to perform a comprehensive review of existing geologic data to determine if there are known faulted areas within the AoR for a proposed injection well in the state and a prohibition on locating new Class II disposal wells within these areas?

   No

4. Are there currently any known wells within the State that have been drilled into the Precambrian basement rock? If there are Class II wells drilled into the Precambrian, does the State see the need to require the wells be plugged back out of the Precambrian with cement and a prohibition of injection in this same formation?

   There are no known injection wells within Missouri that have been drilled into the Precambrian basement rock.

5. Does the State require a complete suite of geophysical logs (including, at a minimum, gamma ray, compensated density-neutron, and resistivity logs) to be run on newly drilled Class II disposal wells? If so, are these completed logs, with analytical interpretation, currently submitted to the MDNR? If not currently required, has the State given any thought on making this a requirement?

   No, Missouri does not require a complete suite of geophysical logs to be run on newly drilled Class II disposal wells, and there are no plans to make this a requirement. An electric log or log showing lithology or porosity of geological strata is required pursuant to 10 CSR 50-2.055(3)(C).

6. Does the State require or evaluate the need for the following measures pertaining to the help mitigate the potential for induced seismicity:

Submission, at time of permit application, of any available information concerning the existence of known geological faults within a specified distance of the proposed well location, and submission of a plan for monitoring any seismic activity that may occur?

Information concerning the existence of known geological faults could result in denial of a permit. Language from the relevant regulations is cited below.

Please clarify this?

MGS will clarify this.

10 CSR 50-2.030 Application for Permit to Drill, Deepen, Plug-Back, or Recomplete

(6)(C) If the state geologist finds that the drilling of a well at the proposed site would be an undue risk to the surface or subsurface environment, the state geologist shall deny the permit.

10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

(6)(C) If the state geologist finds that injection at the proposed site would be an undue risk to the surface or subsurface environment, the permit will be denied.

Having the permit applicant conduct a geophysical survey in areas where there is sparse subsurface geologic information?

No

Measurement or calculation of original downhole reservoir pressure prior to initial injection?

No

Having the permit applicant conduct step-rate injection tests to establish formation parting pressure and better establish maximum injection rates?

Step-rate test data may be used to make injection pressure determinations. Language from the relevant regulations is cited below.

10 CSR 50-2.030 Application for Permit to Drill, Deepen, Plug-Back, or Recomplete

(6)(C) If the state geologist finds that the drilling of a well at the proposed site would be an undue risk to the surface or subsurface environment, the state geologist shall deny the permit.

10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

(6)(C) If the state geologist finds that injection at the proposed site would be an undue risk to the surface or subsurface environment, the permit will be denied.

(9) Injection pressures. A maximum injection pressure for injection wells will be established by the state geologist so that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the confining strata. The injection pressure also should not cause the injected fluid to migrate into an underground source of drinking water.

(A) The injection pressure determinations shall be approved by the state geologist based on one (1) of the following methods:

4. Step-rate test data provided by the operator that details the ability of the injection zone to tolerate the requested pressure;

Installation of a continuous pressure monitoring system?

No

Installation of an automatic shut-off system set to operate if the fluid injection pressure exceeds the permitted maximum level?

No

Installation of an electronic data recording system or manifest system for purposes of tracking all fluids brought by a brine transporter for injection?

No

M. MITs and Inspections:

1. How does the State track an operator's compliance with the applicable 5-year Mechanical Integrity Test (MIT)?

   Bi-annual reports are generated from the Oil and Gas Database.

2. Are there any penalties assessed to owner/operators who are not within the applicable 5- year MIT?

   Compliance assistance is employed as a first effort to help operators comply with the 5-year MIT requirement; however, increased enforcement measures including Letters of Warning, Notices of Violation, and Administrative Orders may be employed. Chapter 259, RSMo, and 10 CSR 50 allow for late fees, penalties, and bond forfeiture.

3. Are well owner/operators required to notify the State of a down-hole failure, or notify the State regarding conditions which may endanger the subsurface environment or the public? If so, how soon must the injection well owner/operator notify the state?

   Yes. Language from the relevant regulation is cited below.

   10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

   (13) If a well cannot demonstrate mechanical integrity, or if other conditions develop that threaten or could threaten the quality of surface or groundwater, the operator shall cease operation of the well, notify the state geologist within twenty-four (24) hours with details as to the nature of the problem, and propose a corrective action plan in writing within five (5) business days. The operator shall have no more than sixty (60) calendar days from the date of initial failure in which to perform one (1) of the following:

   (A) Repair and retest the well to demonstrate mechanical integrity; or

   (B) Plug the well.

4. When the State is performing an inspection, what are the elements that are looked at during the inspection?
   1. General lease condition

2. Lease signage
3. Confirm all wells on lease are in MGS database
4. Confirm all wells in MGS database are on lease
5. Look for abandoned or orphaned wells
6. Confirm all wells on lease are being used according to their documented well type
7. Evidence of actual usage and frequency of usage
8. Injection manifold and current pressures into injection lines
9. Records of pressures if present at site
10. Injection lines and production lines conditions
11. Wellhead condition
12. Well signage
13. Confirm well lat/long locations with GPS
14. Spillage/leakage around wellhead
15. General tank battery area
16. Spillage and leaks around tank battery
17. Containment associated with tank battery
18. Overflow and runoff associated with tank battery
19. Unauthorized discharge from battery area and lease
20. Other observations as deemed necessary

5. <u>Does the State inspector have the authority to sample production and injection fluids, tank contents, and take note of any other conditions that could threaten public health and the environment? If so, does the State input the data into a database?</u>

   The MGS inspector has the authority to sample injected fluids at any time during injection operations. The MGS inspector also takes note of any other conditions that could threaten public health and the environment and forwards the observations to the proper regulating entity. Language from the relevant regulation is cited below.

   <u>What training is provided to the inspector about sampling and is there an SOP for them to follow? If there is an SOP, please provide us a copy if possible.</u>

   If sampling were to be done, SOP's from environmental services would be used and followed.

   10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

   (15) The state geologist or an authorized representative may sample injected fluids at any time during injection operations.

N. Compliance and Enforcement:

Enforcement:

1. Please explain the enforcement process that the state undertakes from the time UIC program violation is discovered until resolution is achieved.

   Oil and Gas and Class II Enforcement Policies and Procedures

   Compliance Assistance - Our primary method of enforcement is "compliance assistance," essentially a less-formal documented phone call or written request to come into compliance with the regulations. Compliance assistance is generally used for violations that do not pose an immediate health or environmental threat. It appears to work well, based on its success rate of about 50 percent. The procedure is as follows:

   1. Create a case number for the issue. This case number shall serve as a case identification number should further enforcement action be necessary and is helpful in creating an easy-to-follow paper trail.
   2. Notify the operator of the violation via email or documented phone call.
   3. In the notification, cite the specific regulations violated.
   4. Give the operator instructions as to what is required to return to compliance.
   5. Set a timeframe or deadline for the operator to return to compliance, typically 30 days.

   Letter of Warning - When compliance assistance fails, or in the case of a repeat offender, the procedure is as follows:

   1. Send the operator a Letter of Warning via USPS certified mail, signed by the unit chief.
   2. In the notification, cite the specific regulations violated.
   3. Give the operator instructions as to what is required to return to compliance.
   4. Set a timeframe or deadline for the operator to return to compliance, typically 30 days.
   5. Keep a copy of the Letter of Warning, compliance assistance, and any other communication regarding the matter in an enforcement case folder (green folder) labeled with the company name and case number.

   Notice of Violation - When the Letter of Warning fails, or in the event an issue poses a moderate health or environmental threat, the procedure is as follows:

1. Send the operator a Notice of Violation via USPS certified mail, signed by the unit chief.
2. In the notification, cite the specific regulations violated.
3. Give the operator instructions as to what is required to return to compliance.
4. Set a timeframe or deadline for the operator to return to compliance, typically 30 days.
5. Give the operator a warning that if compliance is not achieved, an administrative order to return to compliance or plug the well(s) will be issued and associated penalties of up to $1,000 per violation per day pursuant to Chapter 259, RSMo, may be assessed.
6. Keep a copy of the Notice of Violation, Letter of Warning, compliance assistance, and any other communication regarding the matter in an enforcement case folder (green folder) labeled with the company name and case number.

Administrative Order and Assessment of Penalties- When the Notice of Violation fails, or in the event an issue poses an imminent health or environmental threat, the procedure is as follows:

1. Send the operator an order to comply with the regulations via USPS certified mail, signed by the program director.
2. In the order, cite the specific regulations violated.
3. Give the operator instructions as to what is required to return to compliance.
4. Set a timeframe or deadline for the operator to return to compliance, typically 30 days.
5. State that if the operator does not return to compliance the operator's bonds may be forfeited and the enforcement case may be referred to the Attorney General's Office for further enforcement action.
6. If necessary, mail the operator a Penalty Assessment Letter for associated penalties of up to $1,000 per violation per day pursuant to Chapter 259, RSMo.

Appeals to the Oil and Gas Council – Language from the relevant regulation is cited below.

10 CSR 50-1.040(3) Enforcement Action and Appeal Procedures

Any person adversely affected by an order or denial of a permit, license, or transfer issued by the state geologist may appeal the order or denial of a permit, license, or transfer to the council within thirty (30) calendar days of the date the state geologist issued the order or denial. The appeal must be sent by registered or certified mail to the chairperson of the council. . . . The council may sustain, reverse, or modify the state geologist's order or denial of a permit, license, or transfer or may make such

other orders as it deems appropriate under the circumstances, subject to rights of judicial review as provided in section 259.170, RSMo.

2. What are the most common types of Class II injection well violations that are subject to a Notice of Violation (NOV) and follow-up enforcement action?

   Have there been any violations or enforcement actions taken within the last two years?

   No, compliance assistance has been effectively used in the past, with caveat of viable license.

   2017: 26 Enhanced Oil Recovery (EOR) wells – Past due disposal reports. Returned to compliance before deadline.

   2015: 1 EOR well – Abandoned well. Returned to compliance before deadline.

   2015: 12 EOR, 1 Saltwater Disposal (SWD) wells – Abandoned, not properly shut-in. Returned to compliance before deadline.

   2015: 1 SWD well – Disposal well plug-back. Returned to compliance before deadline.

   Common Types of Violations Requiring Enforcement - Any type of violation may require enforcement of one form or another. Several of the most common violations include:

   1. Abandoned wells – Wells that are out of compliance due to extended inactivity without a well shut-in status extension.
   2. Overdue MITs – Wells that are overdue for an MIT or have never had one and should per regulations.
   3. Reporting Violations – Failure to submit *any* of the forms or notifications, including but not limited to completion reports, plugging records, monthly well production and status reports, monthly disposal of produced water reports, and annual injection well monitoring reports.
   4. Operator's License / Bonding – Assuming oil or gas operations without an operator's license and financial assurance/bonding with the State of Missouri.
   5. Permit Violations – The most common permit violations are exceedance of approved injection pressures. However, permit violations may include false well locations, well construction, or any other deviation from the permit.
   6. Insufficient bonding – Operators must have sufficient bonding for all open wells under their ownership.

3. How many and what, if any, ongoing Class II well related enforcement actions operators are be handled through the Attorney General's office?

   None

   If there are none, what situations would prompt such an action?

   If an operator does not comply with an administrative order and there is a threat to the public or to an underground source of drinking water, the Department would refer the case to the Attorney General's Office.

4. Has the State levied financial penalties against owner/operators within the last five years? If so, what was the dollar value of the penalties by year and what were the violations that caused the financial penalties?

   No

Compliance:

1. Besides on-site inspections, what other means does the State employ to encourage, promote, and ensure compliance with UIC requirements?
   1. MIT notice is sent out every 6 months with 12-month advance notice.
   2. Extended Shut-in request renewal notice, sent out every quarter with a six-month advance notice.
   3. Monthly Reports past due notice, sent out every month on the due date of the report.
   4. Annual License and Bonding report notice, sent out in November for a 2.5-month advance notice.
   5. Compliance assistance by which verbal or written communication is initiated with the operator notifying the operator of the potential noncompliance or existing noncompliance issue and offering MGS UIC staff assistance in returning to compliance.
   6. Presentations at Oil and Gas Council meetings concerning rule changes, new rules, and updates on issues of concern.
   7. Hosted webinars addressing rule changes.
   8. Mailings (USPS and email) notifying commercial and noncommercial operators of specific issues or concerns.

2. How or in what manner do State Oil and Gas Council meetings factor in to the State's overall compliance process?

   Can you please clarify?

   Anything MGS does can be appealed to the state oil & gas council (order to plug, pull license, etc). Starts at MGS, then to the Board, then can be repealed.

   Language from the relevant regulations is cited below.

   10 CSR 50-1.040 Enforcement Action and Appeal Procedures

   (1) The state geologist shall cause investigations to be made upon the request of the council or upon receipt of information concerning alleged violations of Chapter 259, RSMo, and implementing regulations or any standard, limitation, or order pursuant thereto, or any term or condition of any permit, and may cause to be made any other investigations consistent with the purposes of Chapter 259, RSMo.

   (2) If, in the opinion of the state geologist, an investigation discloses that a violation of Chapter 259, RSMo, or implementing regulations does exist, the state geologist may issue an order as provided in section 259.070, RSMo, requiring the remediation or abatement of the specified condition(s). The order shall be served by registered mail, return receipt requested. The order shall specify the violations of Chapter 259, RSMo, or implementing regulations or any standard, limitation, or order pursuant thereto, or any term or condition of any permit violated.

   (3) Any person adversely affected by an order or denial of a permit, license, or transfer issued by the state geologist may appeal the order or denial of a permit, license, or transfer to the council within thirty (30) calendar days of the date the state geologist issued the order or denial. The appeal must be sent by registered or certified mail to the chairperson of the council. The council shall treat the appeal as a contested case consistent with Chapter 259 and Chapter 536, RSMo. The council may conduct any hearing it requires to decide the appeal, or may appoint a hearing officer to make a recommended decision. If the council elects to appoint a hearing officer, the hearing officer must be a licensed attorney and a member in good standing of the Missouri Bar. The council may sustain, reverse, or modify the state geologist's order or denial of a permit, license, or transfer or may make such other orders as it deems appropriate under the circumstances, subject to rights of judicial review as provided in section 259.170, RSMo. If any order or denial of a permit, license, or transfer issued by the state geologist is not appealed within the time provided in this section, the order or denial of a permit, license, or transfer becomes final and may be enforced as provided in sections 259.200 and/or 259.210, RSMo.

10 CSR 50-2.020 Bonds

(2) Bond Amounts. Bond amounts, as determined by the council, . . .

10 CSR 50-2.055 Injection Wells, Mechanical Integrity Testing, and Well Stimulation Treatment

(7) The state geologist may grant emergency authority to inject or dispose of fluids at an alternate location, if a facility is shut in for maintenance, testing, repairs, or by order of the state geologist or the council.

How long does/can this emergency authority to inject or dispose fluids at an alternate location last?

Further internal discussion by MGS.

10 CSR 50-2.060 Shut-in Wells, Plugging, and Conversion to Water Well

(3) Plugging Requirements.

(A) Abandoned Wells.

3. In addition to any other remedy provided in Chapter 259, RSMo, or implementing regulations, if the state geologist determines that a well has been abandoned, the department or the council may request that the attorney general institute a civil proceeding to request appropriate injunctive relief, civil penalties, or other appropriate remedy, as provided in sections 259.200 and 259.210, RSMo.

10 CSR 50-2.080 Record Retention and Reporting

(2) Monthly Reporting. Each operator shall prepare in full the following monthly reports on a form provided by the department and submit to the state geologist no later than forty-five (45) calendar days after the end of each calendar month:

(B) Well production, which may be presented for each unit unless requested otherwise by the state geologist or the council;

10 CSR 50-3.020 Production Units and Well Spacing for Enhanced Recovery

(2) An operator may submit to the state geologist an application for the implementation of a production unit of a specified size and shape, with a well configuration of a certain nature of operation, for the purpose of an enhanced recovery project designed to maximize the ultimate recovery of oil or gas or both from the entirety of a single pool or particular portion thereof. The state geologist may approve the application if the proposed production unit is operated by a single operator or owner. If the proposed production unit includes more than one (1) operator or owner, application shall be made to the council, according to procedures in 10 CSR 50-4.020.

10 CSR 50-4.010 Application for Authorization of a Pooling Unit for Primary Production

(1) Before the commencement of drilling a well in a spacing unit, all owners, whether ownership is by deed or lease or farmout, shall enter into a contractual agreement whereby every owner pays his or her mutually agreed fair share of the drilling and operating costs and receives his or her fair share of the oil or gas or the profits produced therefrom. Contractual agreement is achieved by way of the pooling process pursuant to section 259.110, RSMo. The pooling process may be either voluntary or involuntary, as defined as follows:

(B) An involuntary pooling occurs when one (1) or more owners of mineral interests are not able to enter into a private contractual agreement willingly and of their own accord, and the council, upon application by any interested owner and after notice and hearing, issues a pooling order that serves as the binding contractual agreement.

10 CSR 50-4.020 Application for Authorization of Unitization for Enhanced Recovery

(1) The council, upon the written request of an applicant and upon receipt of the information specified in section (2) of this rule and after notice and hearing, may approve the implementation of a production unit of a specified size and shape, and a well configuration of a certain nature of operation, for the purpose of a cooperative development and operation project designed to maximize the ultimate recovery of oil or gas or both from the entirety of a single pool or particular portion thereof. All operators and owners in the proposed production unit shall enter into contractual agreement such that one (1) party is designated the operator of the production unit as a whole, and every owner pays his or her mutually agreed fair share of the drilling and operating costs and receives his or her fair share of the oil, gas, or both produced from the unit, or the profits derived from such production. Contractual

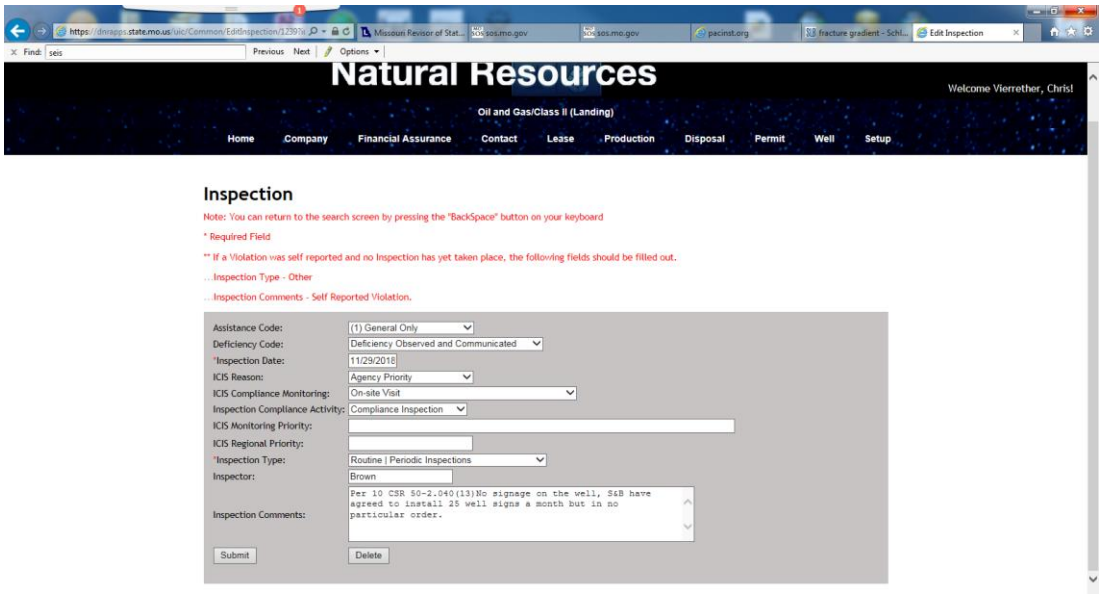
agreement is achieved by way of the unitization process, which is either voluntary or involuntary as defined as follows:

(B) An involuntary unitization occurs when one (1) or more operators or owners are not able to enter into a private contractual agreement willingly and of their own accord, and the council, upon application by any person or party representing the voluntarily agreed production unit proponents that collectively hold at least seventy-five percent (75%) of the right to drill into and to produce oil and gas from the pool and at least seventy-five percent (75%) of all mineral interest and after notice and hearing, may approve the implementation of the production unit and issue a unitization order that serves as a binding contractual agreement for all parties and that, if necessary, designates the operator of the production unit as a whole.

3. <u>Are inspections entered into a database system? If so which databases does the State use and how often is the data updated? Please provide EPA a printout of one such inspection that was entered into the inspection database.</u>

   Yes, inspections are entered into a database system.

   The O&G/UIC C2 program uses the Underground Injection Control ITSD-DNR application (AKA O&G/UIC db)



O. Reporting:

1. What are the State's reporting requirements for Class II wells?

   Language from the relevant regulation is cited below.

   10 CSR 50-2.080 Record Retention and Reporting

   (2) Monthly Reporting. Each operator shall prepare in full the following monthly reports on a form provided by the department and submit to the state geologist no later than forty-five (45) calendar days after the end of each calendar month:

   (A) Well status of each open well in a unit;

   (B) Well production, which may be presented for each unit unless requested otherwise by the state geologist or the council;

   (C) Disposal of produced water, including the amount, type, and method of disposal of all fluids produced from oil wells, gas wells, or underground gas storage reservoirs; and

   (D) The monthly gas well status and production reports may be waived by the state geologist upon application by the operator of the well when production from the well is for the owner's sole and non-commercial use.

   (3) Annual reporting. Each operator shall submit an annual report completed in full on a form provided by the department for the following:

   (A) An annual injection well monitoring report for the previous calendar year, submitted to the state geologist on or before March 1 of the following year;

   (B) A complete inventory report of all open wells as of December 31, submitted to the state geologist on or before January 31; and

   (C) An annual financial assurance report providing documentation of sufficient financial assurance for all open wells, pursuant to Chapter 259, RSMo, and implementing regulations, submitted to the state geologist on or before January 31 of each year and including a signed and notarized statement from any applicable surety or issuer of a letter of credit or certificate of deposit documenting that the referenced instruments are valid and in full force.

2. What is the retention time for records that are required to be kept at or near a well site but not reported to the state?

Records are not required to be kept at or near the well site.

3. What is the required amount of time that an owner/operator is to contact the State and report any spills, leaks or releases of oil and/or produced water?

   Language from the relevant regulation is cited below.

   10 CSR 50-2.065 Operations

   (2) Spill Notification. Each operator, immediately upon discovery or knowledge of any spill or release, will take immediate action in accordance with the Spill Bill, section 260.500 to 260.550, RSMo, and the implementing regulations in 10 CSR 24. This does not alter responsible parties' obligations under any other applicable law.

4. Does the State require a written report and if so, how many days after the release and what is the minimum information that is required in this report?

   The State Oil and Gas Rules do not regulate this issue. Section 260.505, RSMo, in the Spill Bill indicates that "[i]f requested, a written report of particulars of the incident shall be submitted."

P. Electronic Data Systems:

1. Does the State maintain an electronic data system to track information on wells and operators along with other related information? If so, what is the name of the system and what is the extent of the information that it tracks?

   Yes.

   The O&G/UIC C2 program uses the Underground Injection Control ITSD-DNR application (AKA O&G/UIC db).

   The electronic data system O&G/UIC db tracks Oil and Gas/UIC C2 and UIC C5 information. The following are the general categories of new and edited information specific to Oil and Gas/UIC C2:

   1. Company
   2. Financial Assurance
      a. Financial assurance instruments (FAI)
      b. Bonds associated to each FAI